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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/798,720	03/11/2004	Ulrich Krumbein	1890-0064	5005

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EXAMINER	
PARKER, JOHN M	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 05/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/798,720	KRUMBEIN ET AL.	
	Examiner	Art Unit	
	John M. Parker	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 March 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23 and 25-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23 and 25-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicants amendment dated 6 March 2006 in which claims 12-19 were canceled and claim 35 was added has been entered.

Claim Rejections - 35 USC § 112

2. Previous rejections to claims based on 35 USC § 112 are withdrawn

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 23,25-27, 29,30, and 32-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Disney (US Pat. Pub. 2002/0096691).

Regarding claim 23, Disney teaches a field effect transistor comprising:

a substrate having a first conductivity type [fig. 2, 12, n type];

a drain area in the substrate having a second conductivity type opposite to the first conductivity type [fig. 2, 18, p type];

a source area in the substrate laterally spaced from the drain area and having a doping of the second conductivity type [fig. 2, 19, p type];

a channel area in the substrate disposed between the source area and the drain area[fig. 2, 31]; and

a plurality of regions of the second conductivity type extending from the drain area into a portion of the substrate having the first conductivity type, each of the plurality of regions being electrically connected to the drain area and extending into a portion of the substrate having the first conductivity type, such that alternating regions having the first conductivity type and having the second conductivity type are formed below the drain area [fig. 2, 14a-c, they extend into 12 which is of the first conductivity type and alternate in layers].

Regarding claim 25, Disney discloses the field effect transistor of claim 24, wherein the plurality of regions comprise a plurality of parallel columns [fig. 2, 14a-c are parallel].

Regarding claim 26, Disney teaches the field effect transistor of claim 23, wherein the plurality of regions has a comb-shaped cross section [fig. 2, 14a-c are spaced with 12 in between, alternating and giving them a comb-shaped cross section].

Regarding claim 27, Disney discloses the field effect transistor of claim 23, wherein the substrate comprises a surface at which the source area, the channel area, and the drain area are arranged, and wherein the plurality of regions extend in a parallel manner generally away from the surface of the substrate [fig. 2, the source drain and channel, 19,18 and 31 respectively, are all at the surface of the substrate and 14a-c are parallel with that surface].

Regarding claim 29, Disney teaches The field effect transistor of claim 23, wherein the drain area includes a low-doped drain sub-area having a plurality of drain portions in which a doping concentration in a direction toward the channel area

decreases [fig. 2, drain contact area 18 is p+ while 14a-c, 26 and 27 are p- showing a decreased doping concentration towards the channel area].

Regarding claim 30, Disney discloses the field effect transistor of claim 29, wherein a lateral dimension of the plurality of regions is at least as great as a lateral dimension of a most highly doped portion of the plurality of drain portions [fig. 2, 14a-c are laterally greater than 18].

Regarding claim 32, Disney teaches a field effect transistor comprising:

a substrate having a first conductivity type [fig. 2, 12, n type];

a drain area in the substrate having a second conductivity type opposite to the first conductivity type [fig. 2, 18, p type];

a source area in the substrate laterally space from the drain area and having a doping of the second conductivity type [fig. 2, 19, p type];

a channel area in the substrate disposed between the source area and the drain area[fig. 2, 31]; and

a plurality of regions of the second conductivity type extending from the drain area into a portion of the substrate having the first conductivity type [fig. 2, 14a-c], wherein the substrate comprises a surface at which the source area, the channel area, and the drain area are arranged, and wherein the plurality of regions extend in a parallel manner generally away from the surface of the substrate [fig. 2, 18,19 and 31 are all at the surface of the substrate, 14a-c extend deeper into the substrate away from the surface with each layer].

Regarding claim 33, Disney discloses the field effect transistor of claim 31, wherein the plurality of regions comprises a plurality of parallel columns [fig. 2, 14a-c are parallel].

Regarding claim 34, Disney teaches the field effect transistor of claim 32, wherein the plurality of regions has a comb-shaped cross section [fig. 2, 14a-c are spaced with 12 in between, alternating and giving them a comb-shaped cross section].

Regarding claim 35, Disney discloses the field effect transistor of claim 23, wherein the substrate comprises a surface at which the source area, the channel area and the drain area are arranged, and wherein the plurality of regions extend in a parallel manner generally parallel to the surface of the substrate [fig. 2, 18,19 and 31 are all at the surface of the substrate, 14a-c extend deeper into the substrate but remain generally parallel with the surface].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 28 rejected under 35 U.S.C. 103(a) as being unpatentable over Disney (US Pat. Pub. 2002/0096691) in view of Peyre-Lavigne et al. (US Pat. Pub. 2004/0222461).

Regarding claim 28, Disney teaches the field effect transistor of claim 23, wherein:

the source area, the drain area, and the channel area are disposed in the substrate; and

the plurality of regions extend from the drain area away from the surface of the substrate. Disney fails to disclose the entire field effect transistor is formed in an epitaxial layer which is formed on a substrate. However, Peyre-Lavigne teaches forming a LDMOS in an epitaxial layer [Fig. 6, 12].

It would have been obvious to one of ordinary skill in the art to combine the teachings of Disney and Peyre-Lavigne to enable the formation of an epitaxial layer upon a substrate according to the teachings of Peyre-Lavigne. One of ordinary skill in the art would have been motivated to look to analogous art teaching alternative suitable or useful methods of performing the disclosed LDMOS formation in an epitaxial layer, art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

5. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Disney (US Pat. Pub. 2002/0096691) in view of Hossain et al. (US Pat. Pub. 2002/0137292).

Regarding claim 31, Disney fails to teach the use of a third laterally adjacent drain portion in the low-doped drain sub-area. However, Hossain discloses a lighter doped drain region underlying the gate region [pg. 2, paragraph [0017] as well as fig. 2, 112].

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Hossain into the device of Disney by having a third lighter doped drain region underlying the gate region as part of the drain sub-area.

The ordinary artisan would have been motivated to modify Disney in the manner set forth above for at least the purpose of increasing the depletion extension into the n-well region, which helps prevent premature breakdown [Hossain, pg. 2, paragraph [0017]]

Allowable Subject Matter

6. Previous subject matter that was indicated as allowable is withdrawn. The Examiner regrets any inconvenience this may have caused.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John M. Parker whose telephone number is 571-272-8794. The examiner can normally be reached on Monday - Friday 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

John M. Parker

GEORGE R. FOURSON
PRIMARY EXAMINER